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EnviroGroup Limited
The environmental solutions company

AS0302

April 30, 1999

Bonnie Lavelle
Remedial Project Manager
U.S. EPA, Region 8
999 - 18th Street, Suite 500
Mail Code 8EPR-SR
Denver, CO 80202

Dear Bonnie:

As we discussed, enclosed is a copy of the 1962 PAX patent and a 1963 thesis by J. Stadtherr who studied the effectiveness of PAX in crabgrass control. In addition, I have enclosed the results of eight petrographic analyses for perlite in South Globeville surface soils. Perlite was one of the main inactive ingredients of PAX, according to the patent. As indicated on the attached table, perlite was observed in the five samples with high arsenic concentrations and was not observed in the three soil samples with low arsenic concentrations.

Please call if you have any questions.

Sincerely,
EnviroGroup Limited

David J. Folkes, P.E.
Principal

cc: (w/o enc)
Bob Litle, Asarco
Don Robbins, Asarco
Linda Larsen, Esquire, HEWM

7208 South Tucson Way, Suite 125 • Englewood, Colorado 80112 • 303 790-1340 • Fax 303 790-1347

Results of Perlite Analyses

Soil Sample No.	Depth (inches)	Arsenic Concentration (ppm)	Perlite Present?
44K05302Z	0-2	10.7	NO
44K05312Z	0-12	15	NO
44K06302Z	0-2	584	YES
44K06312Z	0-12	159	YES
45F23003A @ 29'	0-2	330	YES
45F23002A	0-2	192	YES
45F24004A	0-2	884	YES
44I06003A	0-2	<6	NO

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DCM Science Laboratory, Inc.
12421 W. 49th Avenue, Unit #6
Wheat Ridge, CO 80033

Optical Microscopy Analysis

Client:		Analysis Date:	2-23-99
	EnviroGroup, Ltd.	Receipt Date:	2-19-99
	7208 S. Tucson Way #125	Client Job No.:	None Given
	Englewood, CO 80112	Project Title:	None Given
		DCMSL Project:	EGL1

The purpose of this analysis is to identify the presence of perlite in four soil samples (client samples no. 44K05302Z, 44K05312Z, 44K06302Z and 44K06312Z). With the aid of a stereomicroscope and using a random grab technique, material from each sample was prepared as a grain mount in 1.550 refractive index liquid. A total of eight preparations for each sample were made for analysis by polarized light microscopy. Known standards of perlite and natural pumice were analyzed for comparison with glass fragments found in the soil samples. Photomicrographs of the known standards and samples are included for documentation.

Conclusions

Client Sample No.: **44K05302Z**
DCMSL Sample No.: EGL1-1

Sample no. 44K05302Z contained one glass fragment having characteristics similar to the pumice standard. The fragment is 40μm in size and completely isotropic. The refractive index is less than 1.550 and the fragment shows a channel-like morphology.

Client Sample No.: **44K05312Z**
DCMSL Sample No.: EGL1-2

Sample no. 44K05312Z also contains a glass fragment with characteristics similar to the pumice standard. The fragment is sharp, colorless, channeled and perforated. The fragment is isotropic and 75μm in size with a refractive index of less than 1.550, similar to the pumice standard.

Client Sample No.: **44K06302Z**
DCMSL Sample No.: EGL1-3

Sample no. 44K06302Z contains a small glass fragment 40μm in size that exhibits the same characteristics as the perlite standard. It is colorless and sharp with an irregular shape. The fragment is completely isotropic. The refractive index is less than 1.550, similar to the perlite standard.

Client Sample No.: **44K06312Z**
DCMSL Sample No.: EGL1-4

Sample no. 44K06312Z contains a small glass fragment which exhibits the same characteristics as the fragments in the perlite standard. The fragment is 40μm in size, colorless, sharp and irregular in shape. The fragment is isotropic with a refractive index less than 1.550, similar to the perlite standard.

David L. Elliott
ANALYST

Photo 1: Pumice standard. Uncrossed polarized light - 400X.

Photo 2 (**44K05302Z**): Glass shard showing characteristics of pumice. Uncrossed polarized light - 400X.

Photo 3 (**44K05312Z**): Glass fragment in the center with morphology like pumice. Uncrossed polarized light - 400X.

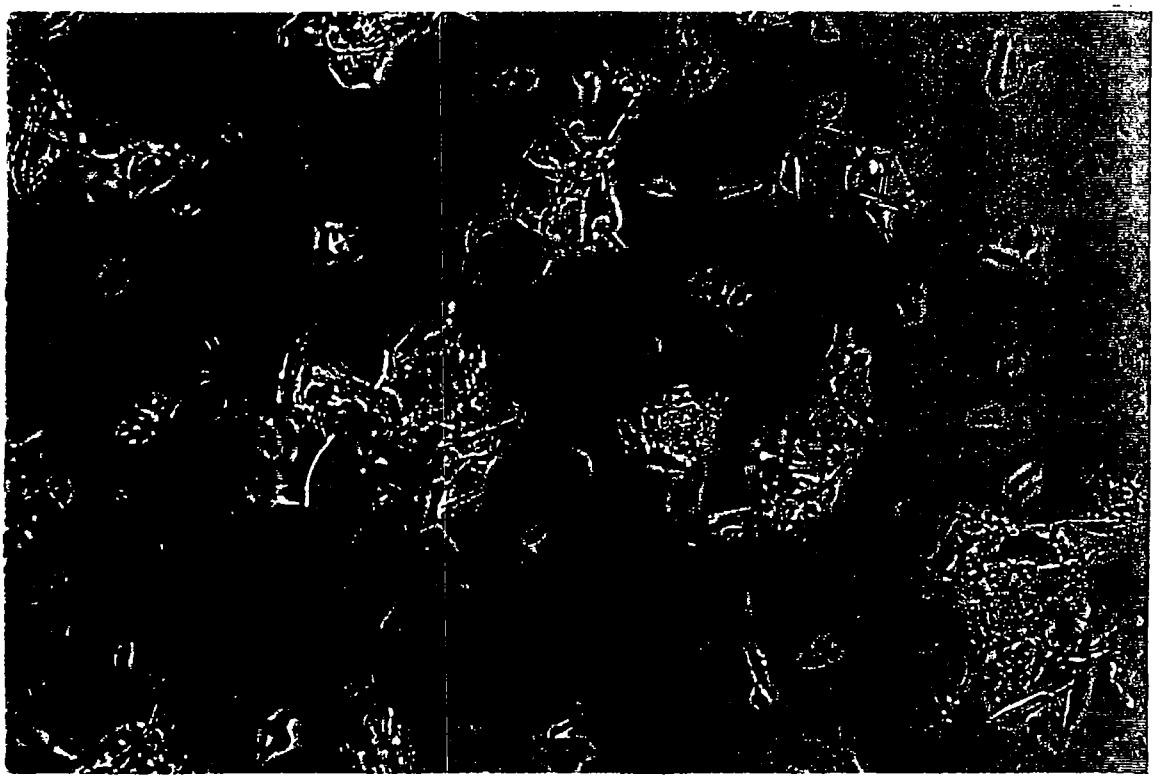

Photo 4: Perlite standard. Uncrossed polarized light - 400X.

Photo 5 (**44K06302Z**): Small glass fragment in the center of the photo displays characteristics of perlite. Uncrossed polarized light - 400X.

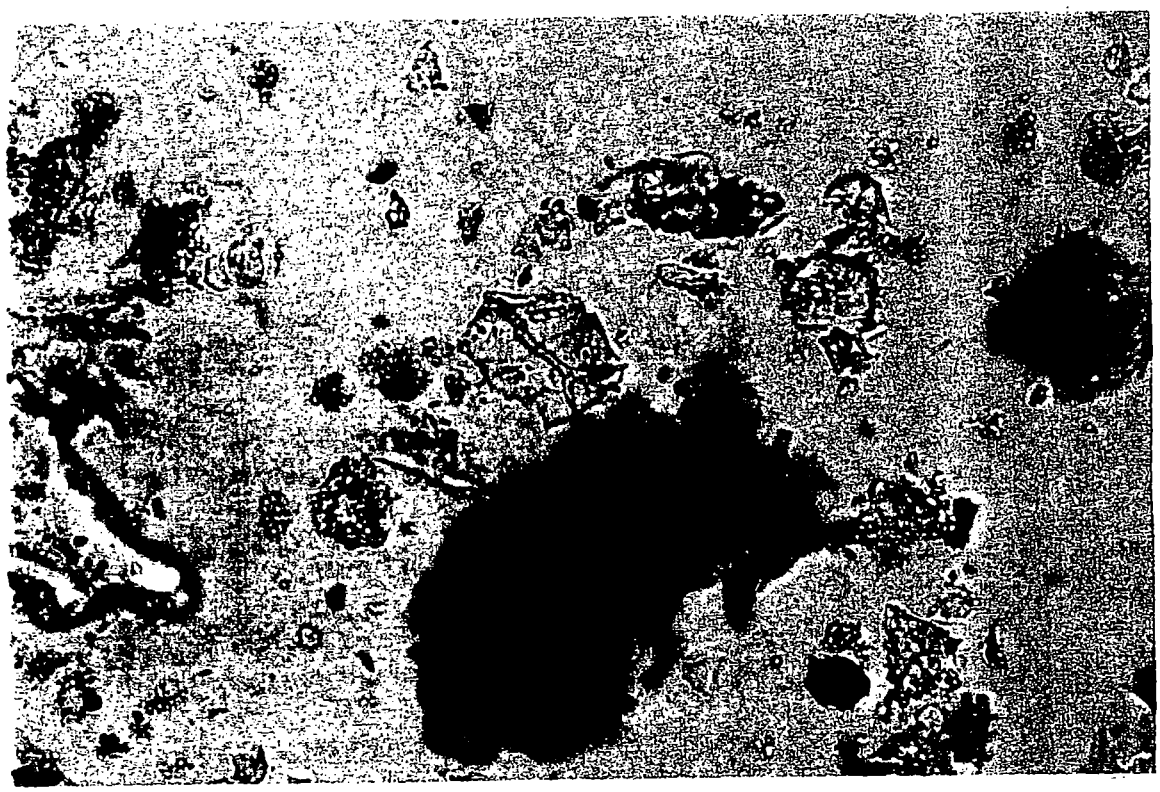

Photo 6 (**44K06312Z**): Glass fragment in the center of the photo with the same characteristics as perlite. Uncrossed polarized light - 400X.

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Optical Microscopy Analysis

Client:		Analysis Date:	3-23-99
	EnviroGroup, Ltd.	Receipt Date:	3-19-99
	7208 S. Tucson Way #125	Client Job No.:	ASO301
	Englewood, CO 80112	Project Title:	De Baca
		DCMSL Project:	EGL3

The purpose of this project is to identify and photograph perlite in a soil sample (client sample no. 45F23003A @ 29'). With the aid of a stereomicroscope, the sample was scanned at various magnifications to determine the presence of intact perlite grains. Eight grain mounts were prepared in 1.550 refractive index liquid for analysis by polarized light microscopy. Known standards of perlite were analyzed for comparison with glass fragments identified in the soil sample.

Conclusions

Client Sample No.: **45F23003A @ 29'**
DCMSL Sample No.: EGL3-1

Soil sample no. 45F23003A @ 29' contains two intact perlite grains. The grains are white in color, rounded in shape and have grain size measurements of 1mm to 3mm. Perlite glass fragments were also identified in the prepared grain mounts. The fragments range from 40μm to 100μm in size, have sharp, angular outlines and show channel-like features. The fragments are completely isotropic and have a refractive index lower than 1.550. These characteristics are consistent with the known perlite standard.

Don L. Abbott
ANALYST

Photo 1 (**45F23003A @ 29'**): Perlite fragment measuring 100μm. Uncrossed polarized light - 400X.

Photo 2 (**45F23003A @ 29'**): Intact perlite grain measuring 3mm. Stereomicroscope - approximately 20X.

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Optical Microscopy Analysis

Client:		Analysis Date:	3-18-99
	EnviroGroup, Ltd.	Receipt Date:	3-16-99
	7208 S. Tucson Way #125	Client Job No.:	ASO301
	Englewood, CO 80112	Project Title:	ASARCO/C. De Baca
		DCMSL Project:	EGL2

The purpose of this project is to identify perlite in two soil samples (client samples no. 45F23002A and 45F24004A). With the aid of a stereomicroscope, each sample was prepared as a grain mount in 1.550 refractive index liquid for analysis by polarized light microscopy. Known standards of perlite were analyzed for comparison with glass fragments identified in the soil samples. Photomicrographs are included for documentation.

Conclusions

Client Sample No.: **45F23002A**
DCMSL Sample No.: EGL2-1

Sample no. 45F23002A contains identifiable glass fragments having characteristics similar to perlite. The fragments range from 40μm to 75μm in size, have sharp, angular outlines and show channel-like features. The fragments are completely isotropic and have a refractive index lower than 1.550. These characteristics are consistent with the known perlite standard.

Client Sample No.: **45F24004A**
DCMSL Sample No.: EGL2-2

Sample no. 45F24004A contains several intact perlite grains. The grains are white in color, rounded in shape and have grain measurements ranging from 0.85mm to 1.75mm. When crushed, the resulting fragments are angular, show channel-like features and have a refractive index less than 1.550. The described characteristics match those of the known perlite standard.

ANALYST

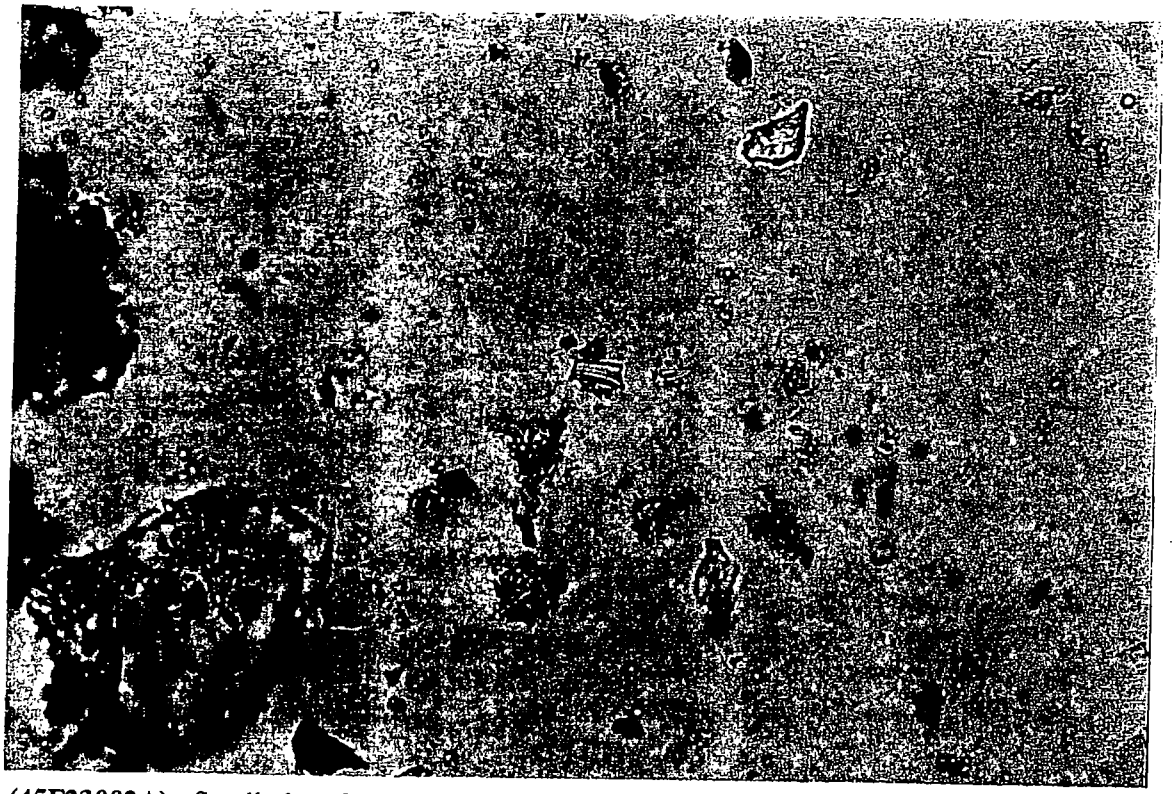

Photo 1 **(45F23002A)**: Small glass fragment in the center and upper right of the photo displays characteristics of perlite. Uncrossed polarized light - 400X.

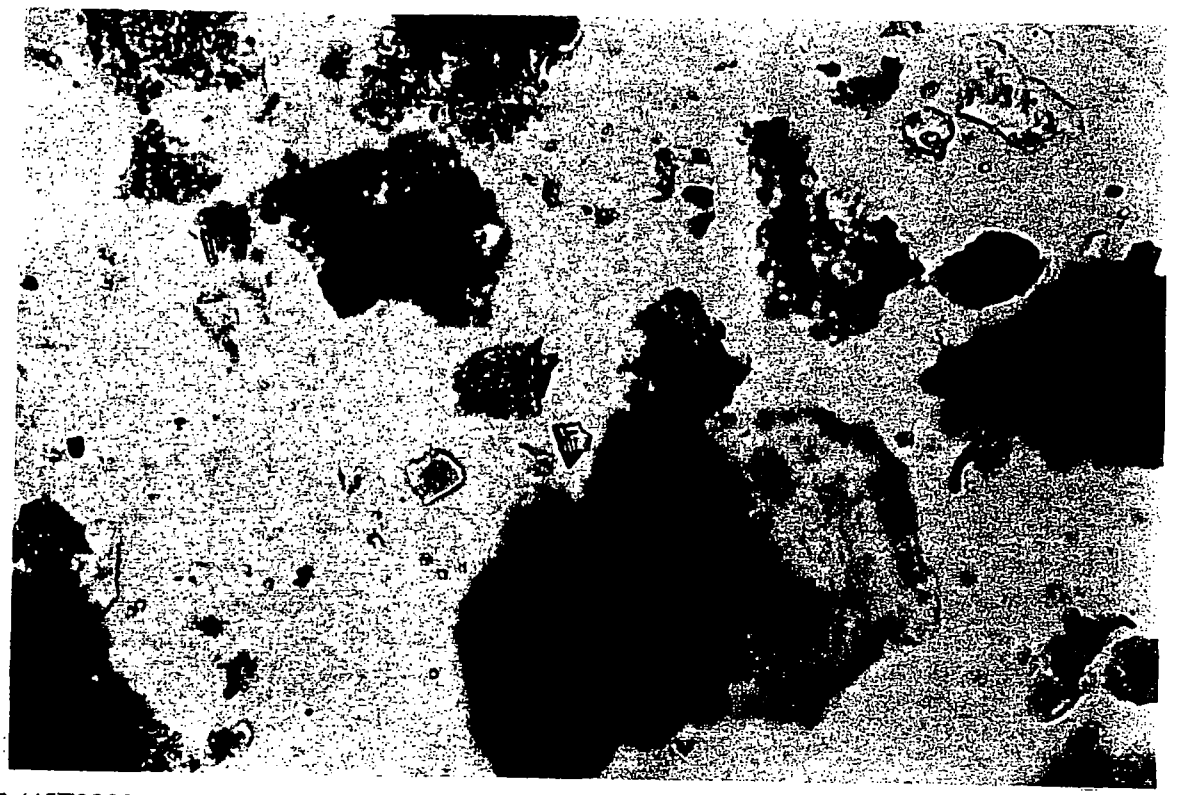

Photo 2 **(45F23002A)**: Glass fragment in the center of photo with the same characteristics as perlite. Uncrossed polarized light - 400X.

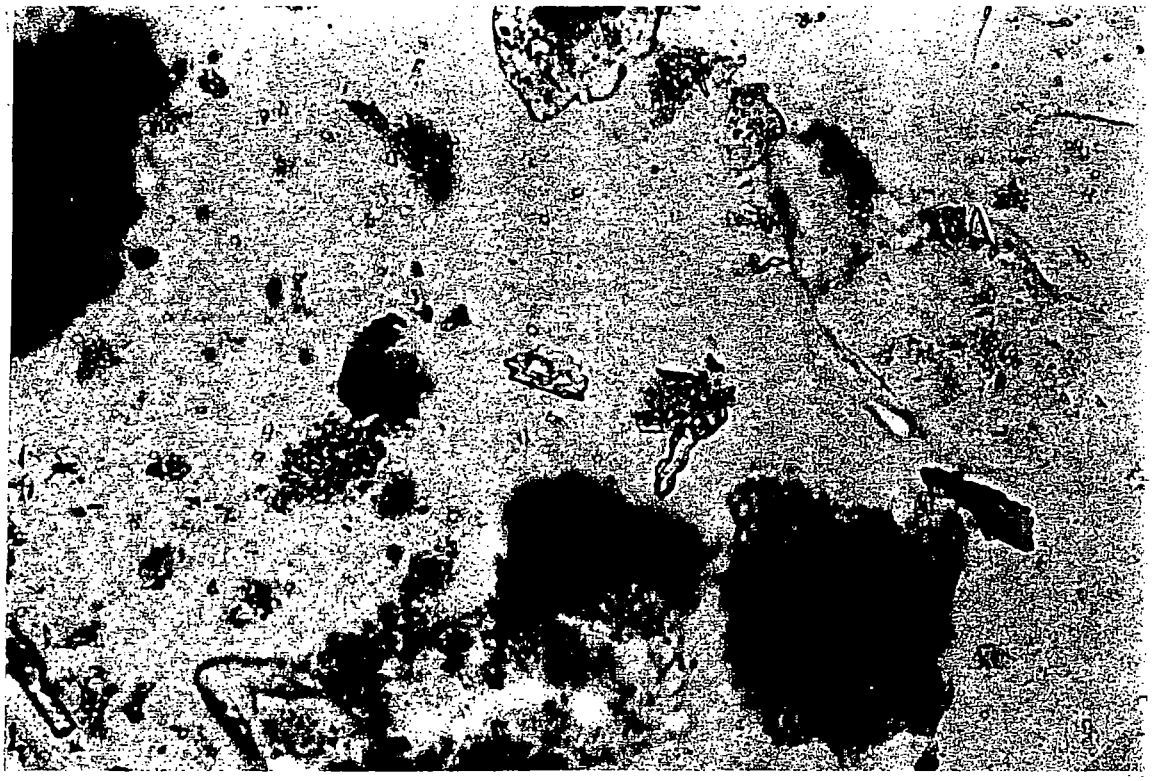

Photo 3 (**45F23002A**): Glass fragment in the center of photo with characteristics similar to perlite. Uncrossed polarized light - 400X.

Photo 4 (**45F24004A**): Several intact perlite grains. Small grain measures 0.85mm and largest grain measures 1.75mm. Stereomicroscope - approximately 20X.

Photo 5 (**45F24004A**): Crushed perlite grain mounted in 1.550 refractive index liquid showing perlite characteristics. Uncrossed polarized light - 400X.

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Wheat Ridge, CO 80033

Optical Microscopy Analysis

Client:		Analysis Date:	4-15-99
	EnviroGroup, Ltd.	Receipt Date:	4-15-99
	7208 S. Tucson Way #125	Client Job No.:	ASO301
	Englewood, CO 80112	Project Title:	De Baca
		DCMSL Project:	EGL4

The purpose of this project is to identify and photograph perlite in a soil sample (client sample no. 44106003A). With the aid of a stereomicroscope, the sample was scanned at various magnifications to determine the presence of intact perlite grains. In addition, eight grain mounts were prepared in 1.550 refractive index liquid for analysis by polarized light microscopy. Known standards of perlite were analyzed for comparison with glass fragments identified in the soil sample.

Conclusions

Client Sample No.: **44I06003A**
DCMSL Sample No.: EGL4-1

Perlite was not detect in soil sample no. 44I06003A.

Paul E. Abbott
ANALYST